



Snapshots Campaign Summary Report

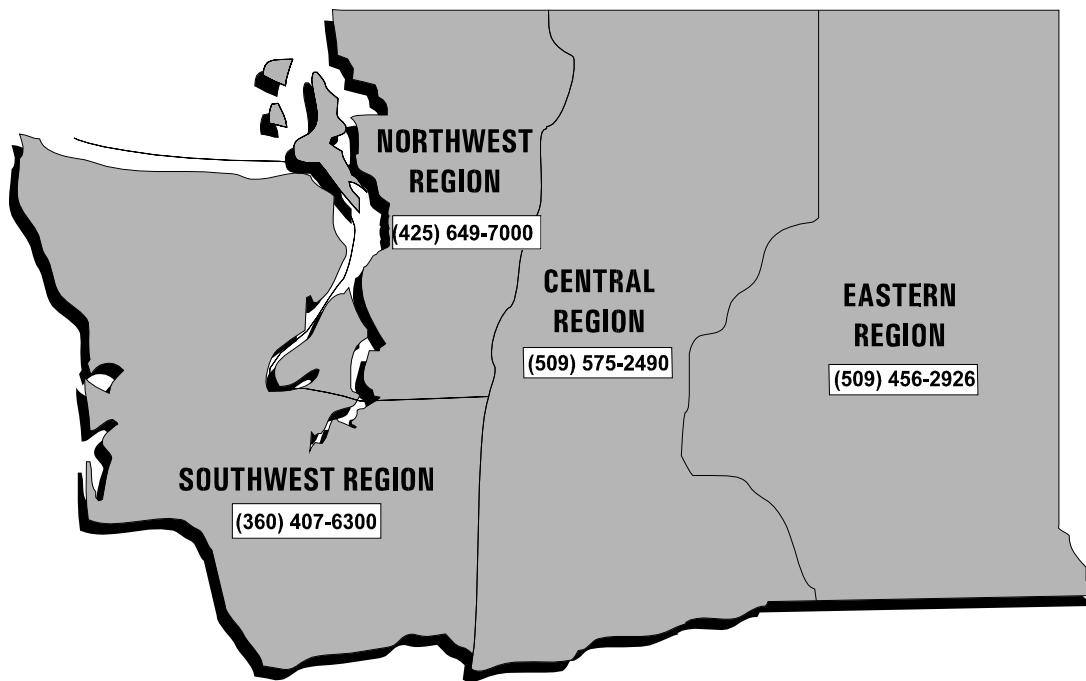
Technical Assistance for Lithographers Screen Printers and Photo Processors in Washington State

Washington State Department of Ecology
Hazardous Waste and Toxics Reduction Program
Revised March 1999
Publication #96-410

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Executive Summary

Introduction

The Washington State Department of Ecology's Hazardous Waste and Toxics Reduction Program is entrusted with enforcing state and federal hazardous waste regulations and promoting waste reduction and recycling. As part of this mission, a new approach towards industry was designed, emphasizing partnership and collaboration as well as streamlined inspections. This approach was first used in an industry-specific outreach campaign for automotive repair shops in 1992. In the fall of 1994, Ecology launched *Snapshots*, the second in an on-going series of such industry-specific campaigns. *Snapshots* focused on technical assistance for lithographic printers, screen printers and photoprocessors across the state. Ecology and local county staff worked together to visit a total of 1,314 shops, including 679 lithography shops, 391 photoprocessing shops and 244 screen print shops.

Snapshots visits provided short, focused, site-specific recommendations to reduce waste generation, improve waste management and help shops achieve compliance with hazardous waste regulations. Waste management practices were discussed with the site representative during the site tour. A written list of recommendations and an informational booklet were then left with the shop. Data on each shop's waste streams was collected, including the amount of waste generated per month and how it was handled. In addition, general information was collected on a variety of other topics, including record-keeping, the presence of floor drains, and the maintenance and testing of silver-recovery equipment.

The various phases of *Snapshots* included a survey of waste management practices in the shops visited, a

compliance follow-up effort, and an evaluation of the campaign's success, including an analysis of a key environmental indicator.

Initial Findings

The major waste management concerns encountered during *Snapshots* visits centered on the following wastes: spent photographic fixer, waste ink, shop towels, electrostatic plate solution, waste paper and film containers. *Snapshots* visits revealed that businesses were using a wide variety of waste management methods. The percentage of shops that were properly managing each waste varied from waste to waste and between industry sectors: (Not all wastes were found at each shop.)

- ✓ 60 percent of the photoprocessing shops and 41 percent of the lithography shops were properly managing their spent fixer.
- ✓ 85 percent of the lithography shops and 47 percent of the screen print shops were using proper management for their used shop towels.
- ✓ 41 percent of the lithography shops were properly managing their waste ink and 24 percent were properly managing their waste electrostatic plate solutions.
- ✓ 65 percent of the lithography shops were managing their waste paper properly.

Executive Summary

A waste management profile was compiled of the total wastes generated statewide by photoprocessing, screen print and lithography shops. The numbers provide a snapshot in time of how the combined waste streams of photo, screen print and lithography shops are managed and in what aggregated quantities. Some key findings included:

- ✓ The largest aggregated waste streams included: waste paper (1,889,000 pounds/month), waste developer (177,440 pounds per month), waste fixer (106,598 pounds/month), waste stabilizer (65,227 pounds/month) and waste bleach (59,049 pounds/month).
- ✓ Most of the spent fixer is treated on-site with a variety of silver recovery equipment; 89,104 pounds of the 106,598 pounds generated per month statewide is treated on-site.
- ✓ Some of the largest amounts of potentially hazardous waste disposed to sewer were: stabilizer (14,772 pounds/month), bleach (7,574 pounds/month), fixer (3,430 pounds/month), ink remover (501 pounds/month) and electrostatic plate solution (344 pounds/month).

Follow-Up

Follow-up assistance was provided to shops that participated in *Snapshots*, with the major focus on shops with significant waste management concerns. The goal was to bring them, voluntarily, to the same level of waste management already practiced by the majority of shops in their industry sector.

Shops selected for follow-up focus received: a letter with a "Certificate of Completion" on which they indicated the status of their recommended actions, a follow up visit if they did not return the certificate or indicated no action on a waste management practice of significant concern, and a follow-up letter if significant waste management issues remained after their follow up visit.

All follow-up methods had positive results:

- ✓ The return rate for certificates was high and 81 percent indicated that all recommendations were completed. Verification visits to a number of the shops showed that 89 percent of the sample had accurately reported the status of their recommendations.
- ✓ 80 percent of the shops receiving follow-up visits were found to have resolved their significant waste management issues between the time of the original *Snapshots* visit and the follow-up visit.
- ✓ The follow-up letters continue to have a positive effect in achieving voluntary compliance at the 24 shops which still have significant waste management concerns.

Executive Summary

Evaluation Survey

Results of the campaign evaluation survey show that *Snapshots* was successful in providing quality assistance to businesses and attaining positive environmental results. The majority of the shops liked the technical assistance approach used for the campaign and gave the overall quality of the visits the two highest ratings. The results also show that the campaign was quite effective in helping shops to improve waste management voluntarily:

- ✓ 90 percent of the shops complied, or attempted to comply, with *at least* one of the recommendations made during their *Snapshots* visit.
- ✓ 76 percent of all recommendations have either been complied with or an attempt has been made to comply with them.
- ✓ 83 percent of the shops indicated that they had learned useful information about how to bring their shop into compliance with hazardous waste regulations.

Environmental Indicators

In addition to the qualitative information provided by the evaluation survey, a quantitative assessment of the campaign's effectiveness was designed. This assessment serves as an indicator of the change in potential environmental impact resulting from *Snapshots*.

A comparison was made before and after *Snapshots* follow-up of the total pounds per month of spent photographic fixer disposed to the sanitary sewer by shops using improper management methods. The total estimated pounds of spent fixer being managed statewide by these three methods¹ was 13,361 pounds per month.

After the *Snapshots* follow-up, the management of most (71 percent) of this improperly managed fixer has markedly improved and the potential environmental impact from its disposal has been significantly reduced. The improvements in spent fixer management include the installation of proper on-site silver recovery equipment and the use of hazardous waste disposal facilities. Taken together, it appears that these changes in the management of spent fixer have significantly reduced the silver content of effluent being sent to sanitary sewers from photoprocessing and lithography shops across Washington State.

¹ King County data is excluded as the King County Hazardous Waste Management Program will be implementing their own follow-up program for their county.

Snapshots Campaign

Introduction

In the fall of 1994, Ecology launched *Snapshots*, the second in an on-going series of industry-specific campaigns. *Snapshots* focused on technical assistance for lithographic printers, screen printers and photoprocessors across the state. Ecology and local county staff worked together to visit a total of 1,314 shops, including 679 lithography shops, 391 photoprocessing shops and 244 screen print shops.

The goal of the campaign was to provide technical assistance to enable these industries to reduce their waste generation, improve their waste management and achieve compliance with hazardous waste regulations through voluntary actions.

This report describes the implementation and results of the various stages of the campaign, including a survey of waste management practices in the shops visited, evaluation of the campaign's success, a compliance follow-up effort and an analysis of a key environmental indicator.

Campaign Description and Initial Findings

Shopsweeps, Ecology's first industry-specific campaign, began in 1992, and focused on automotive repair shops. *Shopsweeps* marked the beginning of a new approach towards working with industry. This new approach was designed to focus efficient technical assistance visits on environmentally high-risk industry sectors dominated by small to medium-sized businesses. Prior approaches relied solely on traditional, time-consuming compliance inspections and penalties to improve compliance performance statewide. The new approach emphasized partnership and collaboration with the selected industry and local governments throughout the development and

implementation of the campaign. With the development of streamlined inspections and the participation of local government staff, large numbers of shops can be visited. This approach also helped to eliminate overlap between state and local hazardous waste programs.

Snapshots, Ecology's second industry-specific campaign, began in the spring of 1994, with the formation of a workgroup which included industry representatives, local government and service providers who met to design the campaign. After state and local staff training sessions were held, *Snapshots* visits to shops began in October 1994, and continued through the next six months, with the majority completed by March 1995. King County local government staff extended visits to lithography shops into the spring of 1996.

Snapshots visits provided short, focused, site-specific recommendations to reduce waste generation, improve waste management and help shops achieve compliance with hazardous waste regulations. Waste management practices were discussed with the site representative during the site tour. A written list of recommendations and an informational booklet were then left with the shop.

During the visits, data on each shop's waste streams was collected, including the amount of waste generated per month and how it was handled. In addition, general information was collected on a variety of other topics, including recordkeeping, the presence of floor drains, and the maintenance and testing of silver recovery equipment. This data was entered into a database which has been used to analyze the findings from the shops that participated in the campaign.

Snapshots Campaign

Major Waste Management Concerns

The major waste management concerns encountered during *Snapshots* visits centered on the following wastes:

- Spent photographic fixer
- Waste ink
- Shop towels
- Electrostatic plate solution
- Solid wastes - waste paper and film containers

A brief description of each area of concern follows:

Spent Photographic Fixer

During photoprocessing, silver is released from film and paper into solutions. Silver has a very high aquatic toxicity and accumulates in the tissue of aquatic organisms. Because of environmental concerns with silver, used photoprocessing solutions containing more than 5 parts per million (ppm) silver are considered a state and federal hazardous waste. Spent fixer and bleach-fixers contain high concentrations of silver, usually between 3,000 and 4,000 ppm, making them hazardous wastes that must be properly managed.

Spent fixer is also a water quality concern. Some sewer districts in the state have set their own local silver discharge limits for businesses to help the sewage treatment plant meet its own discharge levels for silver. These local silver limits range from 0.1 to 0.69 ppm, with one exception set at 3 ppm. Businesses discharging silver-bearing wastes to these sewer districts must meet these local discharge limits which are well below the state hazardous waste discharge limit.

Silver can be recovered from spent fixer by several different types of equipment, but electrolytic recovery units and metallic replacement cartridges are the most commonly used and were the only silver recov-

ery equipment encountered in *Snapshots* visits. Electrolytic units remove silver from a solution by using an electrical current which causes the silver to plate out as metallic silver onto a hard surface. This process is effective in removing the majority of easily recoverable silver in a nearly pure metallic state but can only reduce silver concentrations down to a range of 100 to 300 ppm.

Chemical replacement cartridges (CRC) remove silver by exposing the fixer to a source of iron, causing a chemical reaction to occur which causes the silver to precipitate out of a solution as metallic silver and the iron to dissolve. One CRC can potentially reduce silver to below 5 ppm, but the cartridges begin to show diminishing returns after being used a few times. It is necessary to use two canisters in a series to consistently meet state and local discharge limits. Proper use of two CRCs in a series has the potential to reduce silver levels to 1 ppm. However, fairly rigorous maintenance and testing is required to ensure the proper performance of CRCs to achieve such low silver levels. Additional treatment, or off-site management is required to meet local discharge limits below 1 ppm.

During *Snapshots*, businesses using a minimum of two CRCs in a series (with or without an electrolytic unit as well), were considered to have proper on-site management of spent fixer. These businesses were informed of state and local silver discharge limits and the rigorous maintenance, testing and changeover schedules necessary to consistently meet these limits. Businesses with only an electrolytic unit, or only one CRC, or an electrolytic unit followed by only one CRC were informed that they needed to purchase additional silver recovery equipment or look into off-site options for managing their spent fixer.

Snapshots Campaign

Snapshots data reveals that a variety of methods were used to manage spent fixer in photoprocessing and lithographic print shops. Both off-site and on-site management methods were used. On-site management methods ranged from no treatment, to inadequate management, to proper management. (Figures 1 & 2, pages 13 and 14.)

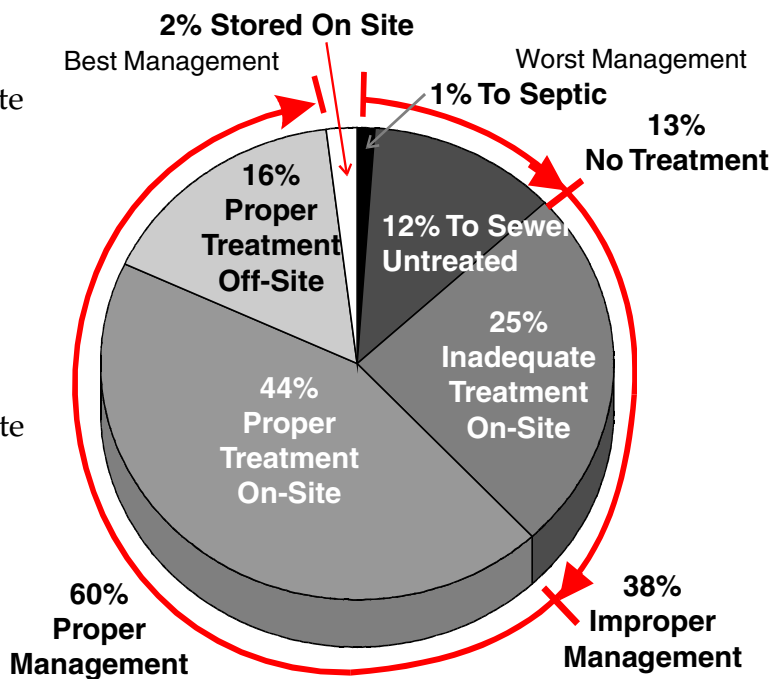
As illustrated in Figure 1, the majority (69 percent) of photoprocessing shops manage their spent fixer on-site; 44 percent with proper treatment and 25 percent with inadequate treatment. A relatively small number of photo processing shops (16 percent) use off-site management for their spent fixer.

Altogether, 60 percent of the photoprocessing shops visited were managing their spent fixer properly, either off-site or on-site. Thirty-eight percent were managing spent fixer improperly, including those shops disposing of it untreated to sewer and septic as well as those using inadequate treatment. Finally, 2 percent store fixer without a planned disposal method, (it is unclear whether the ultimate disposal method will be proper or improper). It is noteworthy that the majority (75 percent) of the photo processing shops with proper fixer management generate more than 5 gallons of waste fixer per month and the majority (85 percent) of shops that dispose of spent fixer to sanitary sewers generate less than 5 gallons per month.

As shown in Figure 2 (page 14), only one-third (29 percent) of lithography shops manage their fixer on-site; 9 percent using proper treatment and 20 percent using inadequate treatment. Another third (32 percent) manage fixer off-site.

Altogether, 41 percent of the lithography shops use proper management for their spent fixer, either off-site or on-site.

Washington State Waste Management Continuum Photoprocessing Shops Spent Fixer*



*Based on the 355 photoprocessing shops for which data on fixer was collected.

FIGURE 1

Another 47 percent manage their fixer improperly, including shops that dispose of it untreated to sanitary sewers, septic and the garbage. The remaining 12 percent store spent fixer without a planned disposal method. As was the case for photo processing shops, the majority (69 percent) of lithography shops with proper management generate more than 5 gallons of waste fixer per month and the majority of shops (85 percent) that dispose of fixer to sewer generate less than 5 gallons per month.

Data from screen print shops is not included here as the majority do not use photographic fixer.

The following comparisons can be drawn for waste management of fixer in photoprocessing shops and lithography shops. First of all, twice as many lithography shops manage their fixer off-site; 32 percent of the lithography shops use off-site management

Snapshots Campaign

Washington State Waste Management Continuum Lithography Shops Spent Fixer*

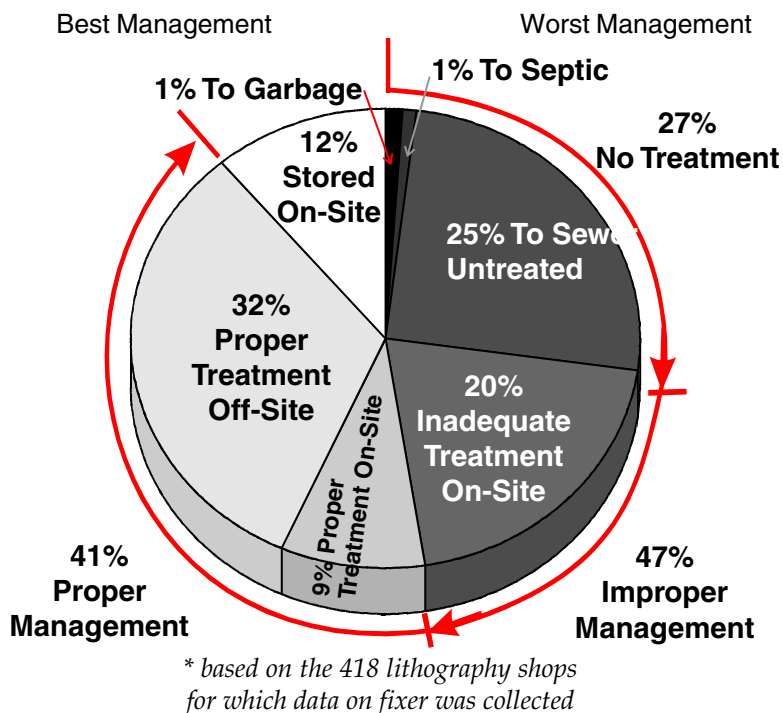


FIGURE 2

whereas only 16 percent of photoprocessing shops do. Conversely, a much higher percentage of the photoprocessing shops use on-site management in comparison to lithography; 69 percent versus 29 percent respectively.

Secondly, overall, spent fixer is better managed by photoprocessing shops than by lithography shops; 60 percent of the photoprocessing shops manage spent fixer properly, compared to only 41 percent for lithography shops. Also, twice as many lithography shops dispose of spent fixer untreated into the sewer system; 25 percent of the lithography shops versus 12 percent of the photoprocessing shops use this disposal method. In addition, a full 12 percent of the lithography shops store spent fixer on-site without a planned disposal method compared to only 2 percent of the photoprocessing shops

that use this management method. As mentioned above, this is not considered to be proper management. Furthermore, of the lithography shops that use on-site treatment for fixer, only one-third of them have proper treatment equipment, whereas two-thirds of the photoprocessing shops using on-site treatment have proper equipment.

Finally, the majority of photoprocessing shops were found to generate more spent fixer per month than most lithography shops do; 63 percent of the photoprocessing shops generate more than 5 gallons per month of spent fixer, compared to only 26 percent of the lithography shops that generate this amount. That spent fixer is better managed at photoprocessing shops than at lithography shops most likely is due to two factors: the larger amounts of fixer waste generated each month at photoprocessing shops and the fact that it is the primary hazardous waste stream for photoprocessing shops.

Waste Ink

Lithographic inks have three primary components in roughly equal proportions: pigments, solids and solvents. Two of these components, pigments and solvents, may make an ink a hazardous waste when disposed. Pigments may use heavy metals such as lead or chromium to achieve their color. Waste inks containing heavy metals in amounts exceeding regulatory limits are considered hazardous wastes as these metals can be environmentally harmful. Waste inks are also considered hazardous waste when their solvent component consists of a petroleum distillate or other hazardous substance such as xylene. Waste ink is generated from cleaning excess ink from the press ink well and from the skins that form on stored ink.

Snapshots Campaign

Washington State Waste Management Continuum Lithography Shops Waste Ink*

Generally, inks used by the textile portion of the screen print industry don't contain heavy metals but the solvent-based inks used by the sign, poster and label screen printers may. Because *Snapshots* focused mainly on textile screen print shops, the following discussion is limited to lithographic inks.

During *Snapshots* visits, inspectors did not determine if specific inks from each shop contained enough hazardous constituents to make them a hazardous waste. However, unless a shop documented that their waste ink was not hazardous, it was generally recommended that it be handled as hazardous waste.

As shown in *Figure 3*, lithography shops manage waste ink in a variety of ways. The majority (62 percent) manage their ink waste improperly. Just over half (52 percent) of the shops dispose of it into the garbage without determining that it is not hazardous waste and 10 percent send their ink waste to the laundry, presumably on their shop towels. Because very few shops demonstrated that they had designated their waste inks and because there is potential for these inks to contain hazardous constituents, these two waste management methods are considered to be improper methods of managing waste inks.

Roughly a third (31 percent) of the lithography shops manage their waste ink properly, including those that use a hazardous waste disposal service (25 percent) and those that recycle their waste ink (6 percent). Most of the shops (61 percent) with proper ink waste management generate more than 5 pounds a month of ink waste.

While the overall majority of lithography shops manage their ink wastes improperly, most of the shops mismanaging ink waste generate relatively small quantities each month, 91 percent generate less than 5 pounds per month.



*Based on the 417 lithography shops for which data on waste ink was collected

FIGURE 3

Furthermore, most of the shops that generate larger quantities of waste ink were found to be managing it properly. However, it is important to recognize that while larger shops may be more likely to manage their ink waste properly, a good number of smaller shops also manage their ink waste properly. This is demonstrated by the fact that 39 percent of the shops with proper ink waste management generate less than 5 pounds a month of this waste.

Shop Towels

When shop towels are used to clean equipment or wipe spills they often come in contact with solvents or inks that have hazardous ingredients. Due to this contamination, if used shop towels are disposed, they may need to be managed as hazardous waste.

Snapshots Campaign



*Based on the 541 shops for which shop towel data was collected.

FIGURE 4

When a laundry service is used for shop towels, along with other Best Management Practices, the towels are not considered hazardous waste. During *Snapshots*, shops were encouraged to reduce their hazardous and solid wastes through using a laundry service for their shop towels, if they were not already doing so. It was also recommended that they use less hazardous cleaning solvents.

As shown in Figure 4, 85 percent of the lithography shops use a laundry service for their shop towels, 14 percent dispose of them in the garbage and 1 percent burn them or send them to an incinerator. Most of the shops (77 percent) that dispose of their shop towels in the garbage use less than 100 towels per month. Most of the shops (76 percent) that send their towels to a laundry service use 200 towels or more each month.

Figure 5 shows that almost half (47 percent) of the screen print shops use a laundry service for their shop towels, the other half (50 percent) dispose of them in the garbage, 2 percent burn them and 1 percent send them to a hazardous waste disposal facility. More than half (56 percent) of the shops that dispose of shop towels in the garbage use less than 100 towels per month. Most of the shops (82 percent) that send their towels to a laundry service use 100 towels or more each month.

These numbers show that both lithography shops and screen print shops tend to use a laundry service when they use more than 100 shop towels per month and dispose to the garbage when they use less than 100 shop towels per month. In comparison to screen print shops, a higher percentage of lithography shops use more than 100 towels per month, therefore a higher percentage use the laundry, as reflected in Figure 4.



*Based on the 217 shops for which shop towel data was collected.

FIGURE 5

Snapshots Campaign

Electrostatic Plate Solution

The solutions used to etch printing plates in the electrostatic etch printing process usually consist of cyanide-based compounds, therefore spent etch solution is usually considered a hazardous waste.

Snapshots data shows that 15 percent of the lithography shops visited use electrostatic etch as part of their printing processes. As shown in *Figure 6*, based on this data, 65 percent of the shops are managing this waste improperly, including those disposing to sewer (43 percent), those disposing to garbage (7 percent), those disposing to laundry (7 percent) and those who let it evaporate between uses (8 percent). Another 24 percent manage this waste properly, 20 percent send it to a hazardous waste disposal facility and 4 percent recycle it off-site. The remaining shops either store it on-site without a planned disposal method (4 percent) or their management method is unknown (7 percent). Most of these shops (75 percent) generate 1 gallon or less waste electrostatic etch each month.

Solid Wastes

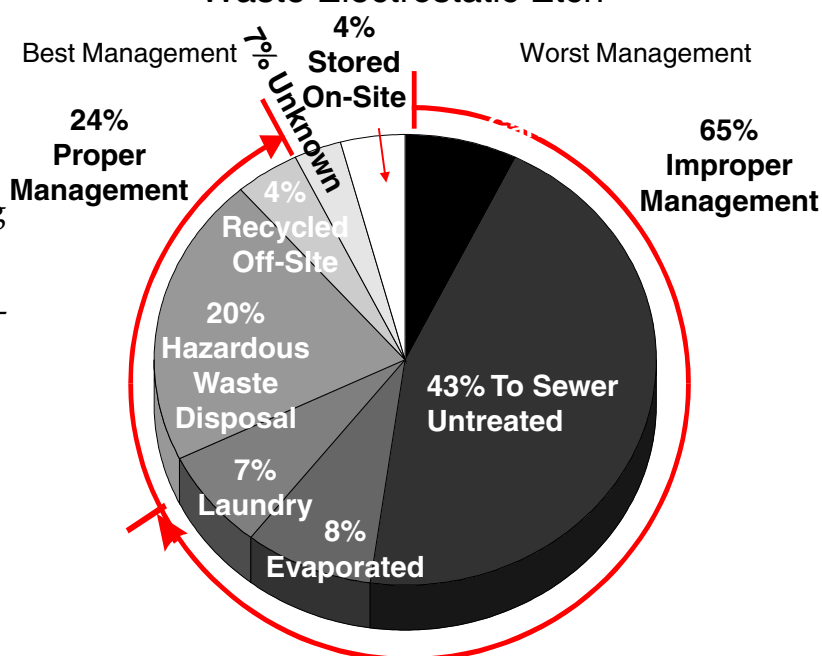
Paper and Plastic Film Containers

Snapshots addressed solid waste management issues as well as hazardous waste issues. Two of the solid waste issues that were part of the campaign are examined here, waste paper and plastic film containers. Waste paper is generated at lithography shops during the printing process while balancing the press and from cutting paper to size. Photoprocessing shops end up with empty plastic film containers after they remove customers' film to process it. As shown in *Figure 7*, 65 percent of the lithography shops are recycling their waste paper, 34 percent are throwing it into the garbage and 1 percent are sending it to an incinerator. Most of the shops (85 percent) that are recycling their waste paper generate more than 100 pounds of this waste each month.

Washington State Waste Management Continuum

Lithography Shops

Waste Electrostatic Etch*



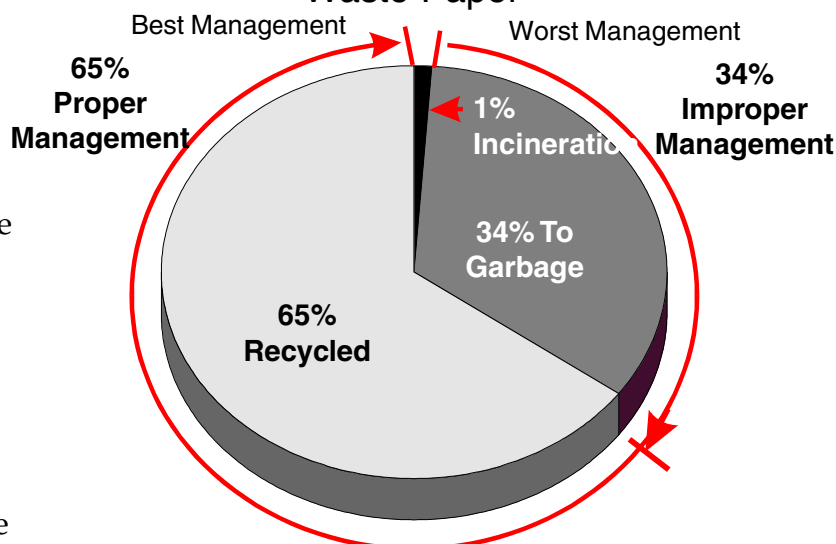
*Based on the 74 shops for which data on electrostatic etch was collected.

FIGURE 6

Washington State Waste Management Continuum

Lithography Shops

Waste Paper*



*Based on the 321 lithography shops for which waste paper data was collected.

FIGURE 7

Snapshots Campaign

But shops with less waste paper are recycling as well, 15 percent of the shops that recycle waste paper generate less than 100 pounds each month. The shops that throw waste paper in the garbage are almost equally divided, about half (53 percent) generate more than 100 pounds of waste paper each month and the other half (49 percent) generate less than 100 pounds per month.

Of the 268 photoprocessing shops for which film container data was collected, 211 (79 percent) of the shops reported that they are recycling these containers through their film manufacturer's program or giving them away to customers. Twenty-one percent of the shops were throwing the containers into the garbage.

Follow-Up Strategy

The main focus of the follow-up strategy was to identify and provide further technical assistance to shops engaged in waste management practices posing a significant threat to the environment. The main goal of the follow-up effort was to bring these shops voluntarily to the same level of waste management already practiced by the majority of shops. Though the original *Snapshots* visits incorporated air quality, water quality, hazardous waste, solid waste, and pollution prevention issues, the follow-up was focused on voluntary compliance with hazardous waste regulations.

With limited staff time available for follow-up, return visits to all shops was not possible. Instead, a strategy was designed that consisted of three levels of follow-up. Different follow-up methods were devised for each level as appropriate. Shops were selected to receive one of these three levels of follow-up according to the severity of the waste concerns found during the original *Snapshots* visit.

Follow-up occurred during the spring of 1996, in order to give shops at least a year to respond to their recommendations from the original *Snapshots* visit.

The first level of follow-up was directed towards shops with no waste management concerns. These shops received a letter thanking them for participating in the campaign and informing them of some of the major concerns of the campaign. The second level of follow-up was directed towards shops which had concerns of a fairly minor nature. These shops received a letter thanking them for participating but also reminding them of outstanding issues at their facility. These site-specific issues were itemized in each letter along with a summary of the major issues of the campaign. Contacts for further technical assistance were also given.

The major focus of the follow-up effort was the third level, which was directed towards shops with waste management practices of significant concern, as listed below:

- ✓ Disposal of hazardous waste to septic systems
- ✓ Disposal of untreated spent fixer to sewer systems
- ✓ Disposal of inadequately treated fixer to sewer systems
- ✓ Disposal of electrostatic plate solutions to sewer systems
- ✓ Disposal of 5 or more pounds of lithographic printing ink into the garbage
- ✓ Disposal of 100 or more shop towels into the garbage

Follow-up to the shops with these waste management concerns was divided into three phases. In phase one, shops received a "Certificate of Completion" on which they were asked to indicate if the actions recommended during their original *Snapshots* visit had been completed.

Snapshots Campaign

Certificates were sent to 187 shops statewide with a return rate of 75 percent. The majority (81 percent) indicated that all recommended actions had been completed. To verify accuracy, 5 percent of the shops that received certificates were revisited and asked to show inspectors the changes they had made. Eighty-nine percent of the shops in the sample demonstrated that they had taken action on the items they had reported as completed.

Phase two consisted of follow-up visits to shops which did not return their certificate or indicated on their certificate that a waste management practice of significant concern (as listed) had not been resolved. Phase two follow-up visits revealed that the majority (80 percent) of the 119 shops revisited had resolved all of their waste management issues of concern after their original *Snapshots* visit.

Phase three, which is on-going, consists of follow-up letters to the shops with significant waste management issues remaining after their phase two follow-up visit. Follow-up letters were sent clearly stating which waste management practices were still not in compliance with hazardous waste regulations. The letters asked the shop manager to respond in writing within 30 - 90 days, and to describe the progress made in resolving the itemized issues. As a result of these letters, 9 of the 24 shops with outstanding issues have taken action and have brought their waste management practices of significant concern into compliance. The remainder will be resolved as soon as possible.

The result of this follow-up effort is that, of the 258 shops that were part of level 3 follow-up, only 15 shops remain with outstanding significant waste management concerns¹. However, it is important to note that the *Snapshots* follow-up strategy focused

on shops with *significant* waste management concerns, and did not address the *entire* waste stream of these shops. Issues such as inadequate recordkeeping or reporting deficiencies were also not part of the follow-up focus.

In summary, all three phases of level three follow-up had positive results. In phase one, the return rate for certificates was high and the majority indicated that all recommendations had been completed. Furthermore, verification visits showed that a high percentage of shops had accurately reported the status of their recommendations. In phase two, the majority of the shops receiving follow-up visits, were found to have resolved their significant waste management issues between the time of their original *Snapshots* visit and the follow-up visit. In phase three, which is on-going, the follow-up letters are already proving to have a positive effect in achieving compliance at the shops which still have significant waste management concerns.

Evaluation Survey Results

In order to assess the effectiveness of the *Snapshots* campaign, a statewide on-site evaluation survey was conducted during November 1995, roughly a year after shops had received their original *Snapshots* visit. The purpose of the evaluation was to determine how well *Snapshots* was received by the shops, if the shops thought Ecology's approach was appropriate, and to what extent the shops carried out the actions recommended to them during the site visits.

¹ These numbers exclude shops in King County, as the King County Hazardous Waste Management program will be implementing their own follow-up for shops within their county.

Snapshots Campaign

The selection of shops to be revisited was by a weighted random sample, with 12 shops in each of the four Ecology regions randomly selected. A total of 48 shops were visited, representing 5 percent of the 954 shops visited during the *Snapshots* campaign. The 954 shops from which the sample was selected included all of the photoprocessing shops, all of the screen printing shops and all of the lithography shops, except for lithographers in King County¹.

Site representatives were interviewed in person at each shop and asked to evaluate the *Snapshots* campaign. Site representatives were also asked to demonstrate whether or not action had been taken on recommendations received during the original *Snapshots* visit. In every case, the site representative interviewed for the evaluation had participated in the original *Snapshots* visit. Only one selected shop was found to be out of business.

The following numbers are based on a 5 percent weighted random sample as described above:

- ✓ 75 percent of the shops complied with at least one of the recommendations made by an inspector during their initial *Snapshots* visit. An additional 15 percent of shops had made an attempt to comply with at least one of these recommendations. Therefore, ***90 percent of the shops complied or attempted to comply with at least one of the recommendations made during their Snapshots visit.***

- ✓ 51 percent of the total original recommendations issued by inspectors were complied with by shops. Shops attempted to comply with an additional 25 percent of the total recommendations. Therefore, ***76 percent of all recommendations have either been complied with or an attempt was made to comply with them.***
- ✓ 83 percent of the shops indicated they had learned useful information about how to bring their shop into compliance with hazardous waste regulations. 54 percent indicated they had learned useful information about how to practice pollution prevention.
- ✓ 44 percent found the most useful part of the visit to be the discussions with the inspector. Another 15 percent found the written recommendations to be most helpful. Only 6 percent found the booklet to be the most helpful and 21 percent found all parts to be equally helpful.
- ✓ 77 percent of the shops had kept the informational booklet received during *Snapshots*. Of these shops, 52 percent said they found it to be a useful reference.
- ✓ 94 percent indicated that the written recommendations clearly told them what waste management/pollution prevention practices needed to be changed or improved.
- ✓ 94 percent liked the technical assistance approach used for the campaign and 96 percent felt Ecology should continue using this approach for future industry-specific campaigns.

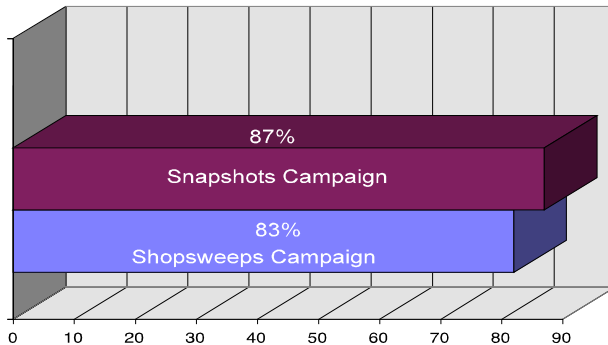
¹King County lithography shops were excluded because county staff were still in the process of visiting these shops at the time of the evaluation.

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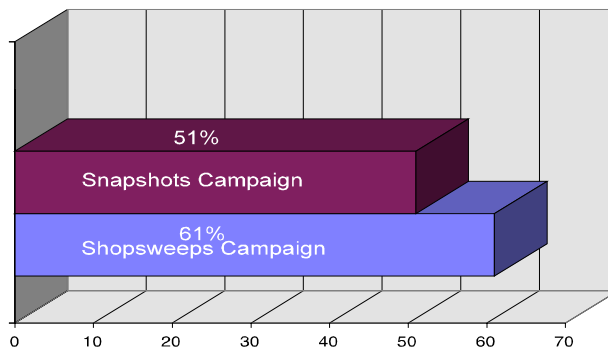
Evaluation Results

Snapshots and Shopsweeps

1) High ratings from shops for overall campaign quality:



2) Total number of recommendations complied with:



3) Total number of shops that complied with at least one recommendation:

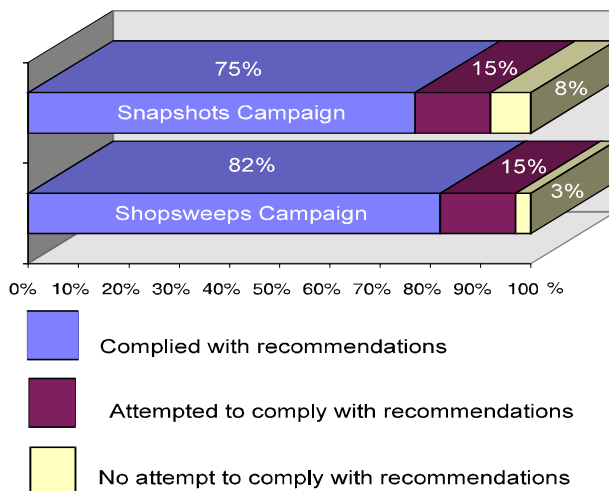


FIGURE 8

Snapshots Campaign

- ✓ On a scale of 1-5, with 1 as the highest rating, *87 percent of the shops gave the overall quality of the visits a 1 or 2 rating.*

As shown in *Figure 8* (page 21), in both *Shopsweeps* and *Snapshots*, over 80 percent of the participants rated their visits with the two highest ratings and over half of the total number of recommendations left by inspectors had been complied with for both campaigns. Furthermore, in both *Snapshots* and *Shopsweeps*, the majority of shops had complied with *at least* one recommendation, and most of the remainder had made an attempt to comply with *at least* one recommendation.

These evaluation results show that both campaigns were successful in providing quality assistance to businesses and both were quite effective in achieving the goal of helping shops to improve waste management voluntarily. Continued use of this approach to assist industry to achieve voluntary compliance appears to be on firm ground.

In addition to the qualitative information provided by the evaluation survey, a quantitative assessment of the campaign's effectiveness was designed. This assessment serves as an indicator of the change in potential environmental impact resulting from *Snapshots*.

Environmental Indicators

Spent fixer was selected as the waste stream to be examined as the environmental indicator. The assessment was designed to examine the amount of change towards proper management of spent fixer brought about by the campaign. The desired result was that silver levels in the effluent from shops with improper fixer management would be significantly reduced after

the campaign. The assumption was that this would reduce the potentially harmful environmental impact of this waste, as silver is highly toxic to aquatic organisms.

To assess the amount of change that occurred, a comparison was made before and after *Snapshots* follow-up of the total pounds per month of spent fixer disposed to the sanitary sewer by shops using one of three improper management methods. These three management methods included the use of only one chemical recovery cartridge (CRC), the use of only an electrolytic unit or the disposal of spent fixer untreated. The total estimated pounds of spent fixer being managed statewide by these three methods was 13,361 pounds per month.

After the *Snapshots* follow-up, the management of most (71 percent) of this improperly managed fixer has markedly improved and the potential environmental impact from its disposal has been significantly reduced. This includes the 63 percent (8,425 pounds per month) now managed with proper on-site equipment (at least 2 CRCs) and the 7 percent (881 pounds per month) now sent to a hazardous waste disposal. It also includes the 1 percent (184 pounds) of spent fixer for which treatment was upgraded by the addition of one CRC.

In addition to the changes in management methods made above, 15 percent (1,994 pounds per month) of the original 13,361 pounds per month of spent fixer is no longer generated, as those shops have gone out of business. The remaining 14 percent (1,877 pounds per month) is being addressed through the on-going follow-up effort.

¹King County lithography shops were excluded because county staff were still in the process of visiting these shops at the time of the evaluation.

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Before *Snapshots*, 13,361 pounds of spent fixer were being disposed to the sewer with a very high silver content. The 1,407 pounds per month of fixer disposed untreated to the sewer had a potential silver content of up to 4,000 ppm and the 8,088 pounds per month of fixer treated by only an electrolytic unit had the potential silver content of 100-300 ppm. The potential silver content of the 3,866 pounds per month of fixer treated only by one CRC is less clear, for an unspecified period of time it could have been under 5 ppm, but also could have ranged as high as 4,000 if the canister was not adequately monitored and changed over when breakthrough occurred.

In conclusion, after *Snapshots* follow-up, 63 percent of the fixer now treated with proper on-site equipment (at least 2 CRCs) is assumed to have a silver content below 5 ppm (or lower) before discharge to the sanitary sewer. For the 7 percent now sent to a hazardous waste disposal facility, it is assumed that the silver is no longer entering the sewer and is either being reclaimed or properly treated. For the 1 percent with treatment upgraded by the addition of one CRC, it is assumed the silver content of the effluent has been greatly reduced for most of the time. The amount of time that this reduction is actually occurring is dependent on the monitoring and changeover schedule of these shops. Taken together, it is clear that these changes in the management of spent fixer have significantly reduced the silver content of effluent being sent to the sanitary sewers from photoprocessing and lithography shops across Washington State.

Chemical Use Inventory

Press Wash and Fountain Solution

Product usage data collected during the on-site *Snapshots* visits created the opportunity to assess the environmental impact and safety of press washes and fountain solutions used in lithography shops in Washington State. Product usage data was not complete for every site, but appears representative of usage trends in the state. Material Safety Data Sheets (MSDS) for the most widely used products were screened for toxicity (presence of RCRA "F-listed" chemicals), air quality impact (vapor pressure of volatile organic compounds) and fire safety (flash point). A total of 27 press washes and 16 fountain solutions were evaluated.

Overall, the results of this product evaluation were positive. Of the 43 products evaluated, only 7 press washes were found to have toxic ingredients. Air quality impacts from these products were minimal due to the low vapor pressures of all but 3 of the products (press washes). Fire safety concerns for the fountain solutions were minimal, only 2 had low flash points (less than 140 degrees F). The only negative result was that the majority (18) of the press washes had low flash points, requiring proper handling and storage to mitigate fire safety concerns.

Observations from *Snapshots* visits also confirmed that the efforts of the lithographic printing industry to use safer products are working. In progressive print shops, solvent odors were minimal. Press operators indicated that the most toxic solvent products are used only when needed and in minimal quantities with improved ventilation. Newer, less

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environmentally harmful products appeared to be the normal products stocked and used by the majority of shops visited.

Waste Management Profiles

Figures 9 and 10 on the following pages present profiles of the management methods used for each waste stream for which data was collected during Snapshots visits. The numbers in these two tables are the total pounds of each waste generated each month statewide.

The numbers provide a snapshot in time of how the combined waste streams of lithography, screen print and photo shops are managed and in what aggregated quantities.

Waste Management Profile—Total Wastes Generated Statewide
By Lithography, Screen Print and Photo Processing Shops
(pounds per month)

Management Methods												
Wastes	Accumulated	Burned	Evaporated	Garbage	Haz. Waste Disposal	Laundry	Recycled	Reused	Sewer	Septic	Other & Unknown	Total lbs/mo.
Deglazer	—	4	121	34	90	92	—	—	9	—	221	571
Electrostatic Plate Solution	18	—	4	2	301	14	105	24	343	—	112	923
Emulsion Remover	—	10	1	—	—	—	—	—	740	16	13	780
Haze Remover	—	—	2	5	—	—	—	—	225	—	13	245
Ink Remover	8	84	685	117	626	38	504	32	501	2	504	3101
Ink Sludge	117	123	5	421	2,436	241	290	—	—	12	65	3710
Paper Waste	15	4,821	—	130,364	—	—	1,725,746	2,711	—	—	25,343	1,889,000
Parts Washer	1,589	826	693	93	5,341	956	1,572	8	94	—	217	11,389
PMT Activator	20	—	25	56	5	—	28	—	126	10	40	310
Plastic Film Containers	—	—	—	12	—	—	505	8	—	—	—	525
Plate Developer Activator	141	44	144	236	908	71	280	37	5,080	109	906	7,956
Press Wash	632	33	1,963	410	1,479	6,819	8	—	160	2	235	11,741
Screen Degreaser	—	—	39	2	40	5	8	—	344	1	11	450
Scrap Film	426	3,001	—	17,321	50	—	7,284	1	—	—	100	28,183
Shop Towels	—	52	—	2,894	42	9,262	11	50	—	—	316	12,627
Single Use Camera	—	—	400	—	—	23	—	—	—	—	—	423
Steel Magazine	3	—	—	1,258	—	—	52	—	—	—	—	1,313
Waste Ink	1,843	219	2	607	3,950	181	197	100	40	12	468	7,619

FIGURE 9

Waste Management Profile — Photographic Developing Wastes Generated Statewide
By Lithography, Screen Print and Photo Processing Shops
— (pounds per month)

Management Methods																
Wastes	Sewer	Septic	Off-Site Treatment	Recycled	Stored On-Site	Garbage	1 MRC* (*metallic replacement canisters)			2 MRC's*	3 MRC's*	Electrolytic Unit (EU)	EU + 1 MRC	EU + 2 MRC's	Other & Unknown	TOTAL lbs/mo.
Developer	156,599	262	5,426	—	473	82	868	4,905	1,200	380	788	344	6,113	177,440		
Fixer	3,430	17	11,566	875	975	138	5,290	24,348	2,098	29,518	4,447	23,403	493	106,598		
Stabilizer	14,772	100	9,176	451	36	0	3,326	14,534	7,750	3,247	885	6,502	4,448	65,227		
Bleach	7,574	—	1,956	23,368	89	—	1,801	14,189	2,462	2,673	754	934	3,249	59,049		

FIGURE 10